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Entrepreneurship education and self-employment: the role of perceived barriers

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Abstract: Many European countries have integrated entrepreneurship in their curricula at several levels of education. However, a systemic view of the influence of entrepreneurship education on being self-employed is lacking. This research assesses the relationship between entrepreneurial learning during education and the probability of being self-employed by using an international dataset – the Flash Eurobarometer survey on entrepreneurship, no. 283 – with information on entrepreneurial perceptions and behavior for more than 20,000 individuals in 36 countries in 2009. Specific attention is paid to the possible mediating role of three perceptions towards entrepreneurship: perceived financial impediments, perceived administrative complexities, and fear of business failure. The results show that our indicators of entrepreneurial learning are positively related with being self-employed. We find that an indirect relationship through an individual's relaxed perceptions towards entrepreneurship is hardly present. Implications of the findings and limitations of the current research are also discussed.

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1. Introduction

Many European countries have started to integrate entrepreneurship in the national primary, secondary, and tertiary education curricula. About two thirds of the European countries explicitly recognize entrepreneurship education at the primary level, whereas about half of the European countries integrate entrepreneurship into a compulsory subject at the secondary level (European Commission, 2012). The number of courses that are devoted to entrepreneurship or new venture creation in American business schools has also increased considerably throughout the years (Katz, 2003). Despite the growing attention for entrepreneurship in the education curricula and in the academic world (Kuratko, 2005), a consistent and systemic view of the influence of entrepreneurship education on the perceptions towards entrepreneurship and on entrepreneurial behavior is lacking (Peterman and Kennedy, 2003). The heterogeneity in entrepreneurship programs within and across countries and the incidence of such programs at various levels of education makes it hard to conduct a more general assessment on how entrepreneurship education may impact an individual's choices to pursue an entrepreneurial career.

This research provides a consistent view on the long-term relationship between entrepreneurial learning during education and the probability of being self-employed. Thereto, an international dataset – the Flash Eurobarometer survey on entrepreneurship, no. 283, 2009 – is used with information on entrepreneurial perceptions, attitudes, and behavior for individuals in 32 European countries, the United States, and three Asian countries. The aim is to investigate whether the probability of being self-employed is higher for individuals who learned about entrepreneurship during their education as compared to individuals without such an educational background. Specifically, we assess whether the relationship between entrepreneurial learning during education and self-employment status runs in an indirect way via an individual's perceptions of start-up barriers (Ronstadt, 1987; Hatala, 2005). The idea is that learning about entrepreneurship during education may lead to a reduction of perceived barriers to entrepreneurship. For example, one may become well aware of the specific administrative procedures that need to be followed for setting up a business and of how such procedures can be dealt with. Following up on this idea, in our research three perceived barriers to entrepreneurship are distinguished: the lack of financial support, the presence of administrative complexities, and the fear of business failure. This research is the first to our knowledge to investigate the mediating role of perceived barriers to entrepreneurship in the relationship between entrepreneurial learning at school and the probability of being self-employed.

Entrepreneurship education may manifest itself in different ways. For example, entrepreneurship education may be offered as a separate – optional or compulsory – subject, as a long-term intensive program, as a part of another subject, or in a cross-curricular way (European Commission, 2012). Furthermore, one can participate in courses at the primary (Rosendahl Huber et al., 2012), secondary (Matlay, 2005), or tertiary level (Oosterbeek et al., 2010). Although entrepreneurship education is aimed at encouraging entrepreneurship in some way, for example in terms of stimulating one's entrepreneurial *interest*, one may distinguish between three other more specific learning objectives (Heinonen and Poikkijoki, 2006). First, education may be targeted at developing entrepreneurship-related *skills* such as negotiation or communication skills. Second, education may be aimed at increasing *knowledge*, for example about entrepreneurs, about their role in society, or about economics or finance in general. A third learning outcome refers to the development of entrepreneurial *attitudes* such as risk-taking behavior, creative and critical thinking, or self-confidence. This report takes a broad view on the entrepreneurial learning outcomes of education, and uses self-assessments about whether an individual's education contributed to the development of their entrepreneurial interest, skills, knowledge, or attitude.

Entrepreneurship has been recognized as a key vehicle by which a region's competitiveness can be stimulated (Kitson et al., 2004; European Commission, 2009). Furthermore, the benefits of entrepreneurial activity in terms of job creation or economic growth have been addressed by Van Praag and Versloot (2007). Hence, policy makers are interested in ways to stimulate the entrepreneurial mindset of individuals. One road to achieve this goal entails the integration of entrepreneurship programs in the national education curricula. The relevance of the current research is illustrated by the number of policy documents that incorporate the promotion of entrepreneurship education at several levels of education (Lanero et al., 2011). This research provides relevant implications when it appears that entrepreneurial learning during education is positively related with being self-employed, especially when this relationship runs through more favorable perceptions towards entrepreneurship.

The data show that about one third of the individuals claim that their school or education has increased their interest to become an entrepreneur. Earlier data show that about 30% of the European students participated in a course about entrepreneurship or setting up a business. While controlling for several relevant socio-demographic characteristics we find that individuals who believe that their education developed their entrepreneurial interest or skills are more likely to be self-employed than individuals without such beliefs. Interestingly, we do not find that these relationships run through the perceived barriers to entrepreneurship such as an individual's perceptions of financial impediments or complexity of administrative procedures.

This report is structured as follows. The following section discusses some earlier literature on the relationship between entrepreneurship education on the one hand and entrepreneurial intentions and behavior on the other hand. Attention is devoted to the possible mediating role of perceptions towards entrepreneurship in the relationship between entrepreneurship education and being self-employed. Section 3 elaborates on the data that are used and shows some descriptive statistics. In section 4 the results are presented and discussed. Section 5 puts the results into perspective by employing an earlier version of the dataset that asks students whether they have followed any course or activity about entrepreneurship or setting up a business. Section 6 concludes.

2. Literature on entrepreneurship education

An individual's human capital represents their possession of skills, traits, knowledge, and experience. An investment in one's human capital can be defined as an activity that affects one's future income – in terms of earnings and consumption – by influencing the resources that the individual possesses (Becker, 1962). The activities that can be seen as investments in human capital differ “*in the relative effects on earnings and consumption, in the amount of resources typically invested, in the size of returns, and in the extent to which the connection between investment and return is perceived*” (Becker, 1962, p. 9). Extensions of the human capital theory have investigated how investments in human capital determine one's occupational choice such as being self-employed or being active in paid employment. Indeed, there have been several empirical attempts to measure how certain aspects of human capital – such as formal educational attainment, managerial experience, or earlier business experience – influence the occupational choice of individuals (Kim et al., 2006; Ucbasaran et al., 2008). Hessels et al. (2011) find that individuals who have recently experienced an entrepreneurial exit – such an exit can be seen as an indicator of accumulated entrepreneurial human capital – are more likely to be involved in entrepreneurial activities than individuals without a recent exit experience. The present research considers specific investments in human capital as possible predictors of current self-employment, i.e. four indicators about the role that entrepreneurship played during an individual's school or education.

Below, this section reviews earlier literature on 1) the relationship between entrepreneurship education and the intention to become self-employed; 2) the relationship between entrepreneurship education and the probability of being self-employed; and 3) the mediating role of an individual's perceptions towards self-employment in the relationship between entrepreneurship education and being self-employed. The studies that are discussed differ regarding their methodologies, and regarding their operationalization of "entrepreneurship education".

2.1. Entrepreneurship education and intentions to become self-employed

Many empirical studies focus on whether entrepreneurship education influences individuals' intentions to start a business. Some studies are sensitive to a self-selection bias because these studies measure intentions only after students have participated in an entrepreneurship education program. For example, based on a program group of 109 pupils and a control group of 140 pupils from 3 secondary schools in the United Kingdom, Athayde (2009) finds that those who participated in a "Youth Enterprise Company Program" are more likely to aspire future self-employment than the pupils in the control group. Lee et al. (2005) compare 379 university students in South Korea and the US; the students can be divided in a group that took a course on entrepreneurship or venture creation, and a group that did not take such a course. Lee et al. (2005) find that the students who took an entrepreneurship course have higher start-up intentions and have more knowledge about new venture creation than students who did not take an entrepreneurship course. In a related way, Kolvereid and Moen (1997) compare graduates with a major in entrepreneurship with graduates who completed another major at a Norwegian business school. On basis of their final sample of 370 graduates, the authors find that the entrepreneurial intentions among students with an entrepreneurship major are higher than among students who completed another major. Using a large sample of 2,582 students from nine higher education institutions in nine different European countries, Gibcus et al. (2012) find that entrepreneurship alumni have more positive intentions towards becoming an entrepreneur than the alumni in the control group. Further results show that the entrepreneurship alumni score higher on risk propensity and need for achievement as compared to the control group alumni, but not on self-efficacy.

Peterman and Kennedy (2003) use pre- and post-testing procedures to test the relationship between entrepreneurship education and entrepreneurial intentions. The authors focus on an Australian enterprise education program that offers a practical introduction to running a business. Peterman and Kennedy (2003) use a test group-control group design with 220 male and female students from 17 different high schools. Entrepreneurial intentions and perceptions of the desirability and feasibility of starting a business are measured before and after participation in the enterprise education program. Whereas in the control group the perceptions of desirability remained unchanged, and the perceptions of feasibility declined, the test group showed significant improvement in the perceptions of both desirability and feasibility of starting a business. Souitaris et al. (2007) measure the change in entrepreneurial attitudes and intentions of 250 science and engineering students over a period of five months. Students from two universities in the UK and France are either in the program group, i.e. they participated in an entrepreneurship program, or in the control group. The students in the program group have higher intentions at the end of the program than at the beginning of the program, whereas students' intentions in the control group remained unchanged. Sánchez (2011) uses a large sample of 864 Spanish university students to measure changes in the entrepreneurial intentions of students before and after enrolling in an entrepreneurship education program. The results are that students who participated in a free-elective entrepreneurship program showed increased entrepreneurial intentions, whereas students who did not participate in this program did not display an increase. In addition, the students of the program group scored higher in terms of proactiveness, risk-taking, and self-efficacy. Without using a control group, Jones et al. (2008) measure the

entrepreneurial intentions of a group of 50 Polish students before and after their participation in an entrepreneurship program at a Polish university. It turns out that the short-term and long-term entrepreneurial intentions were increased throughout the course.

Oosterbeek et al. (2010) evaluates the impact of a student mini-company (SMC) program that is offered by a vocational college in the Netherlands during the academic year 2005/2006. Groups of students have to set up a small business for the duration of the academic year. Entrepreneurial intentions and traits are measured before the start of the program and after the end of the program for 250 students in total. Two groups of students are compared: those at a location where the program is offered and those at a location where the program is not offered. It appears that the SMC program has a negative influence on entrepreneurial intentions and no influence on entrepreneurial traits such as self-efficacy or risk-taking propensity. The negative influence is explained by the fact that the program may make the expectations of students more realistic. A negative influence of entrepreneurship education on entrepreneurship intentions is also found in Von Graevenitz et al. (2010). These authors investigate the impact of a compulsory business planning course in the bachelor curriculum of a German university on the intentions of 196 students. The students were surveyed before the beginning and after the end of the course. Interestingly, it appears that the students learn about their entrepreneurial aptitude during the course and that the course has a positive influence on the self-assessed entrepreneurial skills of the students.

Rosendahl Huber et al. (2012) go one step further and use an experimental design to determine the impact of a five days entrepreneurship education program on the development of the entrepreneurial skills and intentions of primary school pupils. Some authors claim that it is important to foster positive attitudes towards entrepreneurship already during childhood (Peterman and Kennedy, 2003). The research design consists of 85 schools, 118 classes, and 2,413 pupils in the last grade of primary school. The study compares pupils that participated in the program with a control group of pupils that did not attend the program and followed the regular lessons. Classes were randomly assigned to a treatment group and a control group. It turns out that the entrepreneurship program has the intended positive short-term impact on entrepreneurial attitudes such as self-efficacy and risk taking propensity. Importantly, the program has a zero or even negative influence on the entrepreneurial intentions of the primary school pupils.

2.2. Entrepreneurship education and being self-employed

Regarding the relationship between entrepreneurship education and actual entrepreneurial involvement, prior research has suggested that entrepreneurship courses could positively influence new venture creation (Clark et al., 1984). For example, it has been shown that the number of activities that are undertaken by nascent entrepreneurs – i.e. those who are taking serious steps to set up a business – is higher when one has participated in classes or workshops on how to start a business (Davidsson and Honig, 2003). McMullan and Gillin (1998) zoom in on a graduate degree program in entrepreneurship at an Australian university and find that 87% of the surveyed graduates actually started a venture up to two years after graduation.

In their study on Norwegian graduates, Kolvereid and Moen (1997) find that the Norwegian students who have completed a major in entrepreneurship are much more likely to have started a business after graduation than the students without a major in entrepreneurship. Menzies and Paradi (2003) follow graduates of an engineering degree program at a Canadian university. The authors find that individuals who have participated in an elective entrepreneurship course are more likely to be a business owner than those who have not participated. Also, Gibcus et al. (2012) finds more entrepreneurs among the entrepreneurship alumni as compared to the alumni in the control group.

Coduras et al. (2008) use a large Spanish dataset from the Global Entrepreneurship Monitor 2006. Adults with a university degree were asked their opinions about whether their universities support entrepreneurship or not. The authors find a positive relationship between perceived university support to entrepreneurship and entrepreneurial intentions. However, a significant positive relationship between perceived university support to entrepreneurship and actual involvement in early-stage entrepreneurial activity – i.e. nascent entrepreneurship and young business ownership – in a cross-region regression could *not* be found.

Experimental designs that focus on the relationship between entrepreneurship education and being self-employed are relatively scarce because of the lengthy time period in which the study participants have to be followed. However, an attempt was made by Matlay (2008) who measures the long-term impact of entrepreneurship education on the self-employment status of 64 graduates from eight higher education institutions in the UK. The occupational status is obtained one year, five years, and 10 years after graduation; no control group is used. It appears that ten years after graduation being a business owner was the most common outcome and none of the graduates were unemployed or had acquired an employee status.

2.3. The mediating role of perceptions towards entrepreneurship

The above shows that there is evidence that entrepreneurship education influences (intentions for) self-employment in a direct way. However, the influence may also run through other, indirect, channels. For example, entrepreneurship education may alleviate an individual's perceptions of entrepreneurial barriers, either by providing individuals realistic views on how to start a business, or by increasing their skills and know-how. Because these alleviated perceptions may also make the self-employment option more attractive, we expect that perceptions about start-up barriers act as mediators in the relationship between entrepreneurial learning during education and being self-employed.

It has been shown earlier that individuals' perceptions of start-up barriers can indeed be modified as a result of a self-employment training intervention (Hatala, 2005). Hatala (2005) administers the perceptions of several barriers to self-employment before and after an eight week training session that contains topics such as writing a business plan or financial management. The training session is part of a 12-month program that assists unemployed individuals to develop their business ideas. Individuals became more positive about the "start-up logistics", a barrier comparable to our mediating variable that measures the complexity of administrative procedures. However, there were no significant differences (even a slight increase) in the perceptions towards financial difficulties.

Specifically, this research considers the mediating role of three perceived impediments to self-employment, i.e. perceived financial barriers to start a business, perceived administrative complexities to start a business, and an individual's fear of business failure. Regarding the perceived lack of financial support, those who have learned about entrepreneurship may have better knowledge of how and where to obtain financing. In the same way, the expectation is that entrepreneurial learning may provide individuals with administrative skills. Consequently, individuals may perceive less administrative complexities which in turn makes self-employment a more attractive occupational choice. Regarding an individual's fear of failure, it has been shown earlier that individuals who have a higher educational attainment, measured in terms of years of education, have a lower aversion to risk (Kan and Tsai, 2006). In addition, Gibcus et al. (2012) and Sánchez (2011) show that alumni who have attended entrepreneurship education score higher on risk propensity. In other words, more knowledge about entrepreneurship may lower an individual's risk assessment of the occupation.

Earlier research has also linked the perceptions towards entrepreneurship to actual involvement in self-employment. Regarding the financial impediments to entrepreneurship, access to financing has been reported as a barrier for self-employment (Evans and Jovanovic,

1989; Evans and Leighton, 1989; Blanchflower and Oswald, 1998). There is, however, less evidence on the role of an individual's perception of financial impediments. See Grilo and Irigoyen (2006) and Lühje and Franke (2003) for exceptions. Several studies find that individuals with high perceptions of administrative complexities are less likely to express entrepreneurial preferences and intentions or to display entrepreneurial behavior than individuals with favorable perceptions (Grilo and Irigoyen, 2006; Grilo and Thurik, 2005; Lühje and Franke, 2003; Van Stel and Stunnenberg, 2006). Regarding our third perceived impediment to entrepreneurship – fear of failure – earlier studies have found positive relationships between risk tolerance and the probability of being self-employed (Cramer et al., 2002; Caliendo et al., 2009; Kan and Tsai, 2006). However, non-significant influences were found in Rosen and Willen (2002) and Norton and Moore (2006). The present study includes a variable that measures the extent to which an individual fears business failure. A tendency to accept failure may signal that an individual is willing to search for new possibilities such that the likelihood of embracing an entrepreneurial career increases for such an individual.

The possible mediating role of individuals' perceptions of barriers to becoming self-employed has not received any empirical testing so far. However, Lanero et al. (2011) investigate a related issue using a sample of 800 undergraduate students from two Spanish universities. The authors examine whether experienced entrepreneurship education influences entrepreneurial intentions and behavior in an indirect way through an increased perceived feasibility of starting a business. The perceived feasibility of starting a business merely relates to one's own capability rather than external barriers that may impede an entrepreneurial endeavor. For example, the feasibility captures an individual's self-assessment of their capability of managing a business, their administrative skills, or to their ability to recruit and manage the workforce. Importantly, an individual's fear of failure or risk assessment in general is not taken into account. Although experienced entrepreneurship education is indeed associated with an increased perceived feasibility of starting a business, an indirect relationship between entrepreneurship education and entrepreneurial intentions or behavior could not be found.

Zhao et al. (2005) focus on the indirect relationship between entrepreneurship learning and entrepreneurial behavior. 265 MBA students of five universities in the United States are asked about their entrepreneurial intentions, their sense of self-efficacy, and how much they learned about four areas of entrepreneurship during their studies. Interestingly, the authors find that the relationship between entrepreneurial learning and entrepreneurial intentions is fully mediated by an individual's increased self-efficacy.

3. Data and method

The data have been taken from the Flash Eurobarometer survey on entrepreneurship that was executed on behalf of the European Commission in 2009. Comparable surveys on entrepreneurship have been conducted regularly since 2000, i.e. annually from 2000 to 2004 (no. 83, 107, 134, 146, respectively), and in 2007 (no. 192). The number of covered countries and the number of survey questions have been expanded throughout the years. The 2009 version (no. 283) contains samples from the EU 27, the United States, a few other European countries – Croatia, Iceland, Norway, Switzerland and Turkey – and China, Japan and South Korea. In these 36 countries 500 or 1,000 individuals of 15 years or older have been randomly selected for an interview. In the majority of the countries, information was assembled by means of telephone interviews only; in some countries, however, a mixture between telephone interviews and face-to-face interviews was used.¹ Each national sample, except for China's sample,² is representative of

¹ This was the case in Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.

² In China, interviews were conducted with randomly selected individuals of 15 years or older in 50 cities. A list of these urban areas can be found in The Gallup Organization (2009, p. 189).

the population of 15 years and older. All descriptive statistics in the remainder of this report are weighted to make each nation's sample representative of the underlying population. The weights are provided by the European Commission.

The purpose of the entrepreneurship surveys is to gather information about the entrepreneurial behavior, attitudes, perceptions, and preferences of the citizens in the European Union. Buligescu et al. (2012, pp. 173-175) provide an overview of the development of the questionnaire throughout the years. Notably, questions about the role of entrepreneurship during school or education appeared in various versions of the Flash Eurobarometer dataset. Some of the education questions that we use for the present purpose appeared earlier in 2007. The 2007 version of the survey also asks students explicitly whether they participated in a course about entrepreneurship or setting up a business. Therefore, Section 5 of this paper uses some information from the 2007 survey as reference material.

3.1. Measurement

Dependent variable. The aim of this paper is to investigate whether learning about entrepreneurship during earlier education is related with current self-employment, possibly through an individual's relaxed perceptions towards entrepreneurship. We make a global distinction between three groups of individuals: individuals who are self-employed, individuals who are in paid employment, and individuals without a professional activity. Hence, our dependent variable *self-employment* takes a value of 0 if an individual is not active on the labor market, it takes a value of 1 if an individual is currently in paid employment, and it takes a value of 2 if an individual is currently self-employed. The category of self-employed individuals includes shop owners, owner-managers of companies, professionals (e.g., lawyers, medical practitioners, accountants, architects), and farmers. The category of individuals in paid employment consists of white-collar workers and blue-collar workers. Finally, the individuals without a professional activity could be seeking a job, retired, looking after the home, or they could be students.

Independent variables. Entrepreneurial learning during education is captured by four variables. Each individual is confronted with the following four statements:

“My school education made me interested to become an entrepreneur”;

“My school education gave me skills and know-how that enable me to run a business”;

“My school education helped me to better understand the role of entrepreneurs in society”;

“My school education helped me to develop my sense of initiative – a sort of entrepreneurial attitude”.

The corresponding variables are called *education interest*, *education skills*, *education knowledge*, and *education attitude*. Each variable takes a value of 1 when an individual agrees with the relevant statement, and a value of 0 when an individual disagrees with the statement.

The perceived barriers to entrepreneurship that will act as potential mediating variables relate to the lack of financial support when starting a business, the complexity of administrative procedures when starting a business, and an individual's fear of failure. The corresponding statements are the following:

“It is difficult to start one's own business due to a lack of available financial support”;

“It is difficult to start one's own business due to the complex administrative procedures”;

“One should not start a business if there is a risk it might fail”.

The variables are called *perception finance*, *perception procedures*, and *fear of failure*. Again, the variables take a value of 1 in the case of agreement, and a value of 0 in the case of disagreement.

Control variables. There may be a self-selection process in that individuals who participate in entrepreneurship courses may do so voluntarily because they are more interested in becoming self-employed. Although the mere fact of having followed an entrepreneurship course is not available in our 2009 dataset, one could reason that those who really “want” to be an entrepreneur are also more positive about the learning effects of their education in terms of entrepreneurial interest, skills, knowledge, or attitude. To prevent that the estimated influence of our education variables can be partially or fully ascribed to the inherent preference of individuals to become self-employed, we include a measure of “latent entrepreneurship” in our analyses. This variable is based on the question “*Suppose you could choose between different kinds of jobs; which one would you prefer: being an employee or being self-employed?*” (see also Blanchflower et al., 2001; Grilo and Irigoyen, 2006; Gohmann, 2012). The variable *latent entrepreneurship* takes a value of 1 in case an individual answers “being self-employed”, and it takes a value of 0 when an individual answers “being an employee” or cannot make a choice between the two occupations. It has been shown earlier that the preference for self-employment is an accurate predictor of actual self-employment (Verheul et al., 2012). It appears that 45% of the inactive individuals would prefer the self-employment option to being in paid employment; the figures for the individuals in paid employment and self-employment are 41% and 80%, respectively.

Our multivariate analysis includes a *gender* dummy variable that takes a value of 1 for males and a value of 0 for females. Although some studies conclude that the “direct” effect of gender on self-employment is only marginally present or absent when one controls for a range of other determining factors (Fairlie and Robb, 2009; Parker and Belghitar, 2006), there is ample evidence that men are more likely than women to be self-employed (Langowitz and Minniti, 2007). In addition, women’s lower preference for self-employment is an important factor in explaining their lower involvement in self-employment (Verheul et al., 2012).

Estimating the relationship between entrepreneurship education and being self-employed without controlling for an individual’s *age* would lead to erroneous conclusions. First, the dataset consists of several generations of people where each generation followed different education curricula. Therefore, the interpretation of the education questions depends on the age of the individual. Second, the dataset contains certain groups of individuals (students, the retired) for which the probability of being self-employed is lower by definition than for other groups. Third, it has been shown empirically that the probability of engaging in self-employment depends on age. On the one hand, older people may have accumulated more human, financial, and social capital, which helps them to start and run a business. On the other hand, older people are known to be more risk averse (Miller, 1984). There seems to exist a negative or U-shaped relationship between the preferences for self-employment and age (Blanchflower et al., 2001; Grilo and Thurik, 2005; Gohmann, 2012). Evidence regarding the actual involvement in self-employment usually points at positive or inverse U-shaped relationships (Georgellis et al., 2005; Blanchflower and Shadforth, 2007). We include a quadratic age term in our specification to control for such an inverse U-shaped relationship. An individual’s age is a continuous variable that runs from 15 to 97 years, whereas the average age is 45 years with a standard deviation of 18 years.

Entrepreneurship can be integrated at various levels of education. Although there is no information about the education level at which entrepreneurship was offered, there is, however, information about an individual’s *education level* in general, measured by the age at which an individual finished their full-time education. Higher educated individuals may have an increased ability to run a business. Also, it is argued that a higher educational attainment can influence entrepreneurship by making individuals more creative (Plaschka and Welsch, 1990). On the other hand, the opportunity costs of pursuing an entrepreneurial career are higher for higher educated individuals. Current literature points at mixed results regarding the relationship between education and self-employment status (Van der Sluis et al., 2008). Educational attainment is

captured by the age at which an individual finished his/her full-time education. It is a value between 15 and 25; the average value is 19 years with a standard deviation of 3.3 years.

Furthermore, the entrepreneurial background of an individual's parents has been proven to be important in shaping their children's occupational preferences (Dunn and Holtz-Eakin, 2000; Georgellis et al., 2005; Hout and Rosen, 2000). In addition, children of self-employed parents may be more inclined to follow courses on entrepreneurship than children without such parents. We control for parents' occupation by including the variable *self-employed parent* that takes a value of 1 when at least one parent is or was self-employed, and 0 otherwise. It appears that 27% of the individuals have a self-employed parent.

Finally, country dummy variables are included in all regressions to control for country differences. The US is taken as the reference country. The country dummy variables merely serve as control variables; the specific estimation results for these variables will not be shown or discussed in the remainder of this report, but are available from the authors upon request.

3.2. Descriptive statistics

An international comparison of the prevalence rate of self-employment – the dependent variable – and of our independent variables is provided in Table 1. It turns out that 11% of the total number of individuals is self-employed at the moment of the survey. Regarding the education variables, we note that about one third of all individuals believe that their school education promoted their interest in entrepreneurship. The averages for the other three education variables are considerably higher. There are a few countries that score consistently low on all entrepreneurship education indicators. A few examples are Hungary, Italy, Japan, Latvia, Lithuania, Slovakia, and the United Kingdom. Positive examples, at the other end of the spectrum, are China, Croatia, Iceland, Malta, Portugal, Romania, Turkey, and the United States. Individuals in the latter set of countries are much more positive about the learning effects of their education in terms of the development of their entrepreneurial interest, skills, knowledge, and attitude. The Netherlands scores on average on three of the four indicators; the percentage of individuals that believe that their school education has raised their interest in entrepreneurship is very low in the Netherlands as compared to the other countries.

Regarding the perception variables, a first glance at Table 1 reveals that the percentages of individuals that perceive financial difficulties are extremely high. These high perceptions are undoubtedly related with the timing of the data collection, i.e. during a worldwide financial crisis. Relative favorable perceptions about the financial climate can be found in Austria, Finland, the Netherlands, Norway, and South Korea (all below 75%). Countries that score consistently weak on the two dimensions of perceived financial problems and perceived administrative difficulties are Greece, Italy, Latvia, Lithuania, and Romania (both indicators at least 85%). Fear of failure seems to be low in the Scandinavian countries, and high in many EU 10 countries.

Table 2 establishes a link between the education variables and the fact whether an individual is self-employed. It holds that the probability of being self-employed is higher among those who agree with the education statements than among those who do not agree. This provides some preliminary evidence of a positive relationship between entrepreneurial learning in the past and current self-employment status. Similar analyses reveal (results not shown) that an expected negative relationship between the education variables and the perception variables is clearly present only for *perception procedures*.

A matrix with Spearman correlation coefficients is provided in Table 3. Clearly, the education variables are correlated with each other to a considerable extent. That is, the correlations are at least 0.45 for any pair of education variables. Because the education variables will be included separately in the analyses that follow, we do not expect any problems regarding multicollinearity.

3.3. Methodology

Multinomial logit regressions – with standard errors that are robust to heteroskedasticity – will be performed to measure the strength of the relationship between the education variables and the dependent variable. Marginal effects are calculated to assess the impacts of a one-unit increase of the independent variables on the probabilities of observing the three categories of the dependent variables. We will focus on the marginal effects that correspond to category 2 of our dependent variable, i.e. the probability of being self-employed. The full set of marginal effects can be retrieved from the authors on request. For the dummy variables (all variables except for age and education), the marginal effects represent the change in the probability of being self-employed, as a result of a discrete change from 0 to 1. There are many marginal effects that can be calculated; in our case, average marginal effects are used, i.e. marginal effects are calculated for each observation after which the average is taken for the entire estimation sample.

In linear regression models, the indirect effect would be determined by comparing the estimated coefficient of an education variable in a reduced model without the supposed mediating variables (i.e. the perceived barrier variables) with the estimated coefficient in a full model with the mediating variables included. One can then obtain the degree to which the impact of an education variable on self-employment status is mediated by the perceived barrier variables. However, in multinomial logit models and in other nonlinear models one has to resort to alternative approaches (Karlson and Holm, 2011). One such approach – the “KHB-method” – is used in the present paper and is explained in full detail in Breen et al. (2010).³

4. Results

4.1. Direct relations

Table 4 contains the results of the multinomial logit regressions with self-employment status as the dependent variable. Table 4 contains four models where each model includes a different education variable. That is, model A includes *education interest* as the main independent variable, model B includes *education skills*, model C includes *education knowledge*, and model D includes *education attitude*.

The marginal effects corresponding to the dimensions of interest and skills are significant and positive (p-values<0.001). The fact whether an individual believes that their education was beneficial along these two dimensions increases their probability of being self-employed by two to three percentage points on average. These marginal effects are relatively large, given the fact that the predicted probability of being self-employed is 0.11 for both models. Hence, an individual increases his/her chances of being self-employed by one fourth or one fifth if he/she has attained education that was beneficial in terms of developing his/her entrepreneurial interest or entrepreneurial skills, respectively.

The other two dimensions of entrepreneurial learning (in terms of entrepreneurial knowledge and attitude) do not have a significant marginal effect at any reasonable significance level.⁴

³ All analyses have been performed in Stata 12.0. The user-written command `khb` is used to calculate the indirect effects (Karlson and Holm, 2011).

⁴ More detailed analyses use the original formulation of the relevant variables, which are based on a 4-value Likert scale (strongly disagree, disagree, agree, strongly agree) instead of a binary categorization that is used in Table 4. It appears that the group of individuals that *strongly* agrees with the statement about the development of entrepreneurial knowledge is very distinct from the other three groups (i.e., strongly disagree, disagree, agree). That is, when we replace our binary variable in Model C with dummy variables for the four categories, we find that individuals who strongly agree with the statement are 0.015 percentage points more likely to be self-employed on average than individuals who strongly disagree with the statement (p-value<0.10), ceteris paribus. That is, relative to “strongly disagree”, the estimated marginal effects for the categories “disagree”, “agree”, and “strongly agree” are 0.0021 (p>0.10), -0.0053 (p>0.10), and 0.015 (p<0.10). Regarding the last dimension of entrepreneurship education, i.e. entrepreneurial attitudes in Model D, we find a similar result. That is, individuals who strongly agree with the

The results for the perceived barriers to entrepreneurship in Table 4 are relatively consistent across the four models. Clearly, perceived administrative complexities hinders individuals most to become self-employed. That is, the estimated marginal effects corresponding to this perceived barrier are significantly negative in the four models (p -values <0.001), and are significantly larger in absolute sense than those of the other two barriers.

The results for the control variables are according to our expectations. That is, latent entrepreneurship enters the model significantly (p -values <0.001 in Models A-D). Furthermore, men are much more likely than women to be self-employed (p -values <0.001 in Models A-D). The marginal effect of age remains positive up to 53 years after which the impact becomes negative in each model. Educational attainment does not have a significant influence across the board (in Model C only, the marginal effect is significant and positive at 0.10). Finally, the background of an individual's parents is highly relevant, given the structural significant positive marginal effect of the self-employed parents variable (p -values <0.001 in Models A-D).

4.2. Indirect relationships

Next, we investigate the presence of indirect effects where the perception variables act as potential mediators in the relationship between entrepreneurial learning and being self-employed. Again, a multinomial model is used with the same dependent variable as before, and where, for simplicity, no control variables are taken into account. Table 5 shows a decomposition of the total impact of each education variable on being self-employed into a direct part and an indirect part that runs through the three perception variables. To be consistent with our earlier results, marginal effects are used for this decomposition (Breen et al. (2010), pp. 13-14). The indirect part is broken down into three components, one for each perceived barrier. Indeed, we see that the perceived barrier variables mediate the relationship between entrepreneurial learning during education and being self-employed. However, the indirect marginal effects account for only a minor fraction of the total marginal effect for each education variable. That is, the relative magnitude of the indirect effect relative to the total effect is only 8.5% at maximum. The results in Table 5 reveal that the perception of administrative complexities is the largest mediator.

In two occasions, we encounter a negative indirect effect. Table 5 shows that this is the case with *education interest* and *perception finance*, and with *education knowledge* and *fear of failure*. Such a negative indirect effect is possible when an education variable is positively related with a perceived barrier variable, or when a perceived barrier variable is positively related with the probability of being self-employed. Table 4 shows that the latter argument does not hold. In only one case, there is a significant positive relationship between an education variable (i.e. *education knowledge*) and a perceived barrier variable (i.e. *fear of failure*). A positive relationship between an education variable and a perceived barrier variable may be related to the fact that entrepreneurial learning provides students with more realistic, and possibly less optimistic, views about setting up a business. In other words there is a possibility that entrepreneurship education programs expose students "... to the complexities of starting a business about which they had previously been unaware" (Wilson et al., 2007, p. 399). However, we must be careful in interpreting this negative indirect effect that runs through fear of failure, because the total marginal effect of *education knowledge* is not significantly different from zero.

Similar analyses where a set of control variables is taken into account provide even less evidence that the impact of the education variables on being self-employed is mediated by the three perceived barriers to entrepreneurship.

statement are 0.023 percentage points more likely to be self-employed on average than individuals who strongly disagree with the statement (p -value <0.01). Relative to "strongly disagree", the marginal effects for the categories "disagree", "agree", and "strongly agree" are 0.0074 ($p>0.10$), 0.0056 ($p>0.10$), and 0.023 ($p<0.01$).

5. Other analyses

The 2007 version of the Flash Eurobarometer survey on entrepreneurship (no. 192) asks respondents explicitly about whether they have participated in a course or activity about entrepreneurship or about setting up a business. This question has been asked only to students rather than to the entire sample. This 2007 dataset consists of 2,178 students and this group of students represents about 11% of the entire sample.⁵

Table 6 provides an overview of the participation in entrepreneurship courses in the European countries and the US. Table 6 reveals that 31% of the students participated in a course or activity about entrepreneurship or setting up a business.⁶ European Commission (2012) compares countries regarding whether entrepreneurship education is explicitly mentioned in national steering documents on education strategies. Many countries launched such strategies only from 2007 onwards. An exception is Lithuania where the relevant strategy documents mention entrepreneurship already in 2003 and 2004. This may explain the large proportion of Lithuanian students that has followed an entrepreneurship course at school. Only two countries (Poland and France) score higher on this dimension. Another observation is that access to courses about entrepreneurship does not seem to be restricted to students in Western European countries given the high percentages for several countries that have joined the European Union in the past decade.

Three of the four education variables that are available in 2009 were also measured in 2007, i.e. education interest, knowledge, and attitude. Using the 2007 data, it is possible to compare these three dimensions of entrepreneurial learning between students who participated in an entrepreneurship course and students who did not participate in an entrepreneurship course. In this way, we can gain knowledge about the effectiveness of the entrepreneurship courses along the three dimensions. It appears that 60% of the students who followed an entrepreneurship course believe that their school education has developed their interest to become an entrepreneur, whereas this percentage is only 42% for the students who did not follow an entrepreneurship course. For *education knowledge*, the percentages are 82% and 59% for students with and without an entrepreneurship course, respectively. Regarding *education attitude*, the percentages are 77% and 68% for both groups of students. Indeed, binary logit regressions reveal that having participated in an entrepreneurship related course or activity increases one's own perceptions of entrepreneurial interest, knowledge, and attitude.⁷ A further analysis zooms in on the actual steps that students have undertaken to start a business. It turns out that those students who have participated in an entrepreneurship course are more likely to have undertaken steps to start a business.⁸

Hence, students who followed an entrepreneurship course are more convinced that their school education in general has improved their entrepreneurial interest, knowledge, and attitude. Also, those who have followed an entrepreneurship course are more likely to have taken steps to start a business. We have to be aware of the fact that the specifics of the entrepreneurship courses in terms of length, quality, and period in which it was offered are unknown.

⁵ The cumulative age distribution reveals that 90% of these students are 25 years old or younger whereas 64% of the students are 20 years old or younger.

⁶ Note that the numbers in Table 6 have to be interpreted with caution, because of the low number of observations for each country.

⁷ In these regressions, the same set of independent variables (i.e. perceived obstacles to entrepreneurship) and control variables is included as in Table 4. The marginal effects of participation in an entrepreneurship course on entrepreneurial interest, knowledge, and attitude, are 0.18, 0.24, and 0.14 (p-values<0.001), respectively, whereas the predicted probabilities of the dependent variable are 0.47, 0.65, and 0.71, respectively.

⁸ Based on a binary logit regression with a dependent variable that takes a value of 1 if a student has ever started a business or is taking steps to start one, and a value of 0 otherwise. The same set of independent variables and control variables is included as in Table 4. The marginal effect of participation in an entrepreneurship course is 0.061 (p-value<0.01) whereas the predicted probability of the dependent variable is 0.12.

6. Conclusion

This research focused on the relationship between entrepreneurial learning during education and being self-employed. For this purpose, internationally comparable data from the 2009 Flash Eurobarometer survey on entrepreneurship were used. Entrepreneurial learning was captured by four indicators that measure the extent to which an individual's education raised their entrepreneurial interest, or developed their entrepreneurial skills, knowledge, and attitude. We found evidence of a direct relationship between entrepreneurial learning and being self-employed. This is in particular true for individuals who perceive that their education made them interested in becoming an entrepreneur or that it provided them with entrepreneurial skills. These results suggest that self-employment decisions can be affected by fostering entrepreneurial interest and skills through education.

This research also investigated whether the relationship is mediated by an individual's perceptions of obstacles to entrepreneurship. Three such perceived barriers were distinguished: the perception of financial difficulties to start a business, the perception of administrative start-up complexities, and an individual's fear of business failure. We found little evidence that the relationship between our indicators of entrepreneurial learning and the probability of being self-employed is mediated by any of the three perceptions towards entrepreneurship.

This research provides an international, and hence systemic, view of the relationship between entrepreneurial learning and being self-employed, while distinguishing between four entrepreneurial learning outcomes of education. However, this research also suffers from some limitations. The most stringent problem refers to the cross-sectional nature of the survey. Hence, we are not able to follow individuals over time, and, therefore, a self-selection bias may be present. In other words, individuals who are self-employed are more likely to enroll in courses about entrepreneurship or setting up a business, and may be more optimistic about the role that education played in the development of entrepreneurial interest, skills, knowledge, or attitude. We believe that the influence of this bias is minimized because of the following three reasons. First, for most individuals, educational attainment is something that has happened in the past, whereas self-employment status is observed in the present. Second, it may be indeed true that those who are self-employed are more likely to have followed an entrepreneurship course, but it is debatable whether the self-employed would automatically agree with the four statements about entrepreneurship education, i.e. whether their education has been beneficial along the four dimensions. However, because of the self-assessment character of the independent variables, the problem of endogeneity cannot be ruled out. Third, we include an individual's preference for self-employment as a control variable in the regressions such that the influence of our education variables on being self-employed is estimated while controlling for an individual's interest in an entrepreneurial career.

Table 1. Country-specific averages for dependent variable and independent variables.

	Self-employed	Education interest	Education skills	Education knowledge	Education attitude	Perception finance	Perception procedures	Fear of failure
Austria	0.10	0.25	0.47	0.56	0.52	0.72	0.65	0.56
Belgium	0.07	0.29	0.41	0.42	0.56	0.85	0.82	0.52
Bulgaria	0.05	0.32	0.39	0.47	0.47	0.94	0.81	0.69
China	0.22	0.57	0.54	0.75	0.68	0.82	0.57	0.23
Croatia	0.08	0.37	0.62	0.54	0.55	0.90	0.82	0.60
Cyprus	0.14	0.36	0.55	0.50	0.65	0.90	0.70	0.54
Czech Republic	0.10	0.24	0.30	0.37	0.52	0.82	0.78	0.54
Denmark	0.07	0.20	0.48	0.39	0.41	0.76	0.81	0.31
Estonia	0.09	0.28	0.33	0.48	0.46	0.79	0.65	0.66
Finland	0.14	0.29	0.49	0.58	0.59	0.62	0.68	0.39
France	0.06	0.28	0.42	0.45	0.60	0.89	0.76	0.39
Germany	0.10	0.19	0.38	0.52	0.53	0.83	0.77	0.57
Greece	0.15	0.27	0.47	0.43	0.49	0.93	0.85	0.49
Hungary	0.07	0.27	0.37	0.36	0.38	0.93	0.79	0.72
Iceland	0.11	0.48	0.53	0.68	0.65	0.90	0.65	0.42
Ireland	0.11	0.35	0.51	0.48	0.55	0.85	0.72	0.31
Italy	0.11	0.27	0.36	0.38	0.39	0.92	0.86	0.62
Japan	0.16	0.21	0.32	0.43	0.47	0.77	0.63	0.63
Latvia	0.06	0.16	0.18	0.32	0.27	0.95	0.85	0.57
Lithuania	0.08	0.21	0.37	0.30	0.35	0.92	0.90	0.77
Luxembourg	0.07	0.34	0.45	0.53	0.53	0.84	0.77	0.56
Malta	0.05	0.44	0.52	0.58	0.61	0.88	0.74	0.72
Netherlands	0.09	0.20	0.40	0.55	0.54	0.69	0.67	0.50
Norway	0.08	0.33	0.46	0.49	0.59	0.72	0.76	0.38
Poland	0.10	0.28	0.39	0.44	0.45	0.90	0.76	0.67
Portugal	0.09	0.43	0.58	0.70	0.67	0.92	0.84	0.63
Romania	0.07	0.44	0.48	0.59	0.62	0.95	0.90	0.61
Slovakia	0.08	0.25	0.32	0.43	0.40	0.93	0.79	0.62
Slovenia	0.07	0.31	0.43	0.57	0.57	0.84	0.69	0.64
South Korea	0.13	0.40	0.39	0.59	0.57	0.69	0.63	0.68
Spain	0.10	0.27	0.50	0.53	0.55	0.92	0.82	0.50
Sweden	0.06	0.28	0.45	0.42	0.51	0.80	0.75	0.50
Switzerland	0.11	0.33	0.50	0.55	0.64	0.78	0.68	0.41
Turkey	0.22	0.74	0.71	0.76	0.76	0.88	0.79	0.72
United Kingdom	0.09	0.23	0.32	0.35	0.45	0.84	0.72	0.36
United States	0.17	0.51	0.67	0.71	0.74	0.85	0.73	0.26
Total	0.11	0.32	0.44	0.50	0.54	0.85	0.75	0.53

Table 2. Probability of being self-employed for the education variables.

	% self-employed for value 0	% self-employed for value 1
Education interest	0.087	0.15
Education skills	0.088	0.13
Education knowledge	0.10	0.11
Education attitude	0.098	0.11

Two sided *t*-tests show that the probabilities of being self-employed are statistically different for *education interest* ($p < 0.001$), *education skills* ($p < 0.001$), and *education attitude* ($p < 0.01$), but not for *education knowledge* ($p > 0.10$).

Table 3. Spearman correlation matrix of dependent variable and independent variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Self-employed	1						
(2) Education interest	0.072*	1					
(3) Education skills	0.053*	0.45*	1				
(4) Education knowledge	0.0023	0.46*	0.46*	1			
(5) Education attitude	0.014*	0.45*	0.45*	0.51*	1		
(6) Perception finance	-0.040*	0.014	-0.0089	-0.0049	-0.0093	1	
(7) Perception procedures	-0.072*	-0.0086	-0.020*	-0.015*	-0.012	0.26*	1
(8) Fear of failure	-0.062*	-0.0019	-0.021*	0.014*	-0.012	0.13*	0.14*

The correlations are based on 21,120 observations. For interpretational convenience, the variable *self-employed* takes a value of 1 (self-employed) or 0 (in paid employment or inactive) in this table.

* denotes a significant correlation coefficient at 0.05.

Table 4. Results multinomial logit regressions models A-D; the marginal effects denote the impacts on the probability of being self-employed (category 2 of the dependent variable).

	Model A		Model B		Model C		Model D	
	Marg. eff.	SE	Marg. eff.	SE	Marg. eff.	SE	Marg. eff.	SE
<i>Independent variables</i>								
Education interest	0.028***	(0.0047)						
Education skills			0.021***	(0.0043)				
Education knowledge					-0.0011	(0.0043)		
Education attitude							0.0052	(0.0043)
Perception finance	-0.012*	(0.0058)	-0.0091	(0.0058)	-0.010 [^]	(0.0058)	-0.0099 [^]	(0.0058)
Perception procedures	-0.023***	(0.0050)	-0.022***	(0.0050)	-0.022***	(0.0050)	-0.022***	(0.0050)
Fear of failure	-0.012**	(0.0044)	-0.012**	(0.0044)	-0.011*	(0.0044)	-0.011**	(0.0044)
<i>Control variables</i>								
Latent entrepreneurship	0.12***	(0.0044)	0.13***	(0.0043)	0.13***	(0.0043)	0.13***	(0.0043)
Male	0.065***	(0.0043)	0.066***	(0.0043)	0.066***	(0.0043)	0.066***	(0.0043)
Age/10	-0.0061***	(0.00066)	-0.0064***	(0.00067)	-0.0059***	(0.00068)	-0.0062***	(0.00067)
Education/10	0.0074	(0.0066)	0.0066	(0.0066)	0.012 [^]	(0.0066)	0.0093	(0.0066)
Self-employed parent	0.059***	(0.0051)	0.058***	(0.0051)	0.060***	(0.0051)	0.059***	(0.0051)
<i>Country dummies</i>								
	YES		YES		YES		YES	
Predicted probability	0.11		0.11		0.11		0.11	
Observations	20,526		20,589		20,547		20,606	
R ² (McFadden)	0.27		0.27		0.27		0.27	

Standard errors are between parentheses. [^] denotes a significant marginal effect at 0.10; * at 0.05; ** at 0.01; and *** at 0.001. Marginal effects corresponding to the other two categories of the dependent variable (category 0: inactive on the labor market; category 1: in paid employment) are available from the authors on request.

Table 5. Decomposition of total marginal effect of education variables into direct and indirect marginal effect.

	Model A	Model B	Model C	Model D
	Education interest	Education skills	Education knowledge	Education attitude
Total marginal effect	0.049 ^{***}	0.035 ^{***}	0.00044	0.0091 [*]
Direct marginal effect	0.049 ^{***}	0.033 ^{***}	0.00042	0.0083 [*]
Indirect marginal effect	0.00039	0.0016	0.000022	0.00077
% Indirect to total	0.80%	4.5%	5.0%	8.5%
via perception finance	-0.27%	0.26%	16%	1.1%
via perception procedures	0.74%	1.9%	103%	3.9%
via fear of failure	0.23%	2.3%	-114%	3.6%

^ denotes a significant marginal effect at 0.10; * at 0.05; ** at 0.01; and *** at 0.001. The degree of significance of the indirect marginal effect cannot be calculated (see Breen et al., 2010).

Table 6. International comparison percentage of students that followed courses about entrepreneurship.

Country	% No	% Yes
Poland	44%	56%
France*	48%	52%
Lithuania	55%	45%
Ireland	57%	43%
United Kingdom	59%	41%
Finland	60%	40%
Cyprus	64%	36%
Slovenia*	65%	35%
Italy	67%	33%
Hungary	68%	32%
Latvia*	69%	31%
Estonia	70%	30%
Spain	70%	30%
Denmark	71%	29%
Luxembourg	71%	29%
Austria*	71%	29%
Slovakia	71%	29%
Belgium	72%	28%
Norway	72%	28%
Malta*	73%	27%
Greece	73%	27%
Netherlands	74%	26%
Germany	75%	25%
Sweden	78%	22%
Portugal	83%	17%
Czech Republic	83%	17%
United States	87%	13%
Iceland	87%	13%
Total	69%	31%

Based on the survey question “*At school or university, have you participated in any course or activity about entrepreneurship or setting up a business?*” in the Flash Eurobarometer survey on entrepreneurship, no. 193 (2007). In total, 1,435 students answered this question.

* means that the percentages for this country are based on less than 30 observations.

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